CLAIMS

At least the following is claimed:

1. A composition, comprising:

a basic component;

an acidic component;

at least one monoacrylate component;

a light sensitive initiator, wherein a polymerization reaction between the at least one monoacrylate component and the light sensitive initiator occurs upon exposure to optical energy; and

a polar binder comprising a viscosity modifier and a surface tension modifier, wherein the polar binder is capable of stimulating a crosslinking reaction between the basic component and the acidic component.

2. The composition of claim 1, wherein the light sensitive initiator is selected from ultraviolet initiators, visible initiators, and combinations thereof.

3. The composition of claim 1, further comprising components selected from a retardant, an inhibitor, a wetting agent, a colorant, and combinations thereof.

4. The composition of claim 1, wherein a powder includes the basic component, the acidic component; and wherein the polar binder includes a polar solvent, a monoacrylate component, the surface tension modifier, the viscosity modifier, and the light sensitive initiator.

5. The composition of claim 1, wherein a powder includes the basic component; wherein the polar binder includes a polar solvent, the acidic component, a monoacrylate component, the surface tension modifier, the viscosity modifier, and the light sensitive initiator.

6. The composition of claim 1, wherein a powder includes the basic component, a first acidic component; wherein the polar binder a polar solvent, a second acidic component, a monoacrylate component, the surface tension modifier, the viscosity modifier, and the light sensitive initiator.

7. The composition of claim 1, wherein the powder components have a particle size from about 1 to 100 microns.

8. The composition of claim 1, wherein the viscosity modifier is selected from ethanol, hexanediol, pentanediol, ethylene glycol diacetate, potassium aluminium sulphate, isopropanol, ethylene glycol monobutyl ether, diethylene monobutyl ether, dodecyldimethylammonium proposane sulphonate, glycerine triacetate, ethyl acetoacetate, polyvinyl pyrrolidone, polyethylene glycol, polyacrylic acid, sodium polyacrylate, and combinations thereof.

9. The composition of claim 1, wherein the surface tension modifier is selected from ethanol, hexanediol, pentanediol, tergitols, ethylene glycols, fluorosurfactants, and combinations thereof.

10. The composition of claim 1, wherein the basic component is selected from metal oxides, metal oxide salts, reactive glasses, and combinations thereof.

11. The composition of claim 1, wherein the acidic component is selected from alginic acid, gum arabic, nucleic acids, pectins, proteins, carboxymethylcellulose, ligninsulphonic acids, acid-modified starch, polyacrylic acid, polymethacrylic acid, polymethacrylic acid copolymer with methyl methacrylate, polyvinyl sulphonic acid, polystyrene sulphonic acid, polysulphuric acid, polyvinyl phosphonic acid, polyvinyl phosphoric acid, the homo- and copolymers of unsaturated aliphatic carbonic acids, the anhydrides of the unsaturated aliphatic carbonic acids, and combinations thereof.

12. A method of producing a structure, comprising the steps of:

providing a powder, wherein the powder includes at least one component selected from a basic component and a first acidic component;

providing a polar binder, wherein the polar binder includes a surface tension modifier and a viscosity modifier, and wherein the polar binder includes at least one component selected from a polar solvent, a second acidic component, a monoacrylate component, and a light sensitive initiator;

dispensing the powder and the polar binder onto a build platform to form a layer of a composition; and

forming a three-dimensional object from the composition on the build platform.

13. The method of claim 12, wherein dispensing includes:

dispensing a layer of the powder; and

dispensing a layer of the polar binder onto the layer of the powder thereby forming the layer of the composition.

14. The method of claim 12, wherein the polar binder is dispensed using at least one ink-jet printhead.

15. A solid freeform fabrication system for producing a three-dimensional object, comprising:

a dispensing system including a powder and a polar binder, wherein the dispensing system is adapted to dispense the powder and the polar binder, wherein the powder includes at least one component selected from a basic component and a first acidic component, and wherein the polar binder includes at least one component selected from a polar solvent, a second acidic component, a monoacrylate component, a surface tension modifier, a viscosity modifier, and a light sensitive initiator.

16. The solid freeform fabrication system of claim 15, wherein the dispensing system includes at least one ink-jet printhead.

17. The solid freeform fabrication system of claim 15, wherein a first ink-jet printhead includes the polar binder.

18. The solid freeform fabrication system of claim 15, wherein the dispensing system includes a powder spreading system.

19. The solid freeform fabrication system of claim 15, further comprising:

a computer control system operative to control the dispensing system.

20. The solid freeform fabrication system of claim 15, further comprising:

a computer aided design system.

21. The solid freeform fabrication system of claim 15, wherein the powder components have a particle size from about 1 to 100 microns